to measure the angular width of each stone from the observational base, and both the side measures and the average measures thus obtained should be studied. The following are averaged measures :—

1.	N.W. 72° S.E. (base line)	N. 19° E.
2.	East point	N. 2° E.
3.	N. 74° E.	N. 13° W.
4.	N. 63° 15′ E.	N. 28° W.
5.	N. 48° 45′ E.	N. 42° W.
6.	N. 33° 45′ E.	N. 57° W.

The average angle for the series is about 89° 30′. In two instances, side alignments form perfect right angles. In other instances it seems highly probable that the angular width of a stone was utilised for two alignments. Thus, of the side measures averaged as N. 42° W., the one on the north side of the stone is 38° and the one on the south side is 46°. By the table of solstitial azimuths for lat. 57° N. given on page 381 of "Stonehenge" (sec. ed.), 46° would be sunset at the summer solstice with a horizon of 2° high, and 38° would be sunrise at the winter solstice with the horizon a trifle higher.

It is a great thing to know that the position of each stone in a Pictish circle is, or was intended to be, at right angles to some other position. If the observational base of other types of circles could be discovered it is extremely likely that the same fundamental principle would be found applied. Given a number of rectangular alignments, with horizon measures, it is practically certain that for each circle a star cast, like that of actors in a drama, could be made out, making the determination of the period involved comparatively easy.

Without horizon measures, the solar alignments of the Dunecht circles are easily recognisable. Judging by the one complete circle described, we are warranted in assuming that both the May-year and the solstitial year are provided for. Regarding the base line as of first importance, we have May-year, solstitial, and stellar circles of one and the same cultural type. For an explanation of this variety in unity we need, for one thing, a new survey of all the Pictish circles on the plan suggested by Dr. Browne. JOHN GRIFFITH.

Thorpe's Dictionary.

A Dictionary of Applied Chemistry. By Sir Edward Thorpe. Assisted by Eminent Contributors. Vol. 2: *Calculi to Explosion.* Revised and enlarged edition. Pp. viii + 717. (London: Longmans, Green and Co., 1921.) 60*s.* net.

THE "Dictionary of Applied Chemistry" has now become so indispensable to workers in pure as well as in applied chemistry that it can be stated without fear of contradiction that no library either in the university or in the works can be regarded as complete without it. The appearance of the second volume of the new edition following so closely on that of the first will therefore be welcomed, and will be taken as an indication that the remaining volumes will be published with equal rapidity. The first feature which is noticeable in the new volume is the decrease in size and the increased handiness compared with the corresponding volume of the last edition. This result has been attained by reducing the number of pages by about eighty and by using a thinner paper, the general effect being to produce a volume which can be held in the hand readily without fatigue. It follows, although it is not specifically stated, that the publishers intend to issue the dictionary in six or more volumes instead of the five which have hitherto sufficed.

The subject-matter in the volume under review therefore comprises part of that issued in vol. 1 of the last edition and part of that which appeared in vol. 2. The last edition of the dictionary was reprinted in 1917 from the revised edition of 1912, but despite the comparatively short time which has elapsed—a period during which little scientific work was done—it has been found possible to introduce much new matter; this is shown by the fact that the subjects dealt with in the present volume occupy 717 pages, whereas in the last edition they filled 547 pages only.

On the whole there is little call for criticism. The article on carbohydrates—one would like to see this name abandoned because, obviously, the sugars of the rhamnose group, $C_6H_{12}O_5$, are not carbohydrates—by E. F. A. is altogether admirable and stands out by itself as an illustration of what can be done by a master of his subject to make a highly complex chapter in organic chemistry interesting to expert and lay-reader alike. On the other hand, the article on camphor is very disappointing. It is difficult to understand what useful purpose can be served by publishing an article on the chemistry of this substance which does not contain one single graphic formula. Had this edition been published thirty years ago there might have been some justification for the inclusion of this article. The articles on carbolic acid and cellulose remain practically unaltered; it is doubtless too soon to expect to find a full description of the many important uses to which these substances and their derivatives were put during the war.

The article on chlorine has been entirely rewritten by H. B., and is an exhaustive account of this element. It contains a vigorous reference to the use of poisonous substances by the Germans during the war, and gives a list of some of those employed. One would like to have seen, however, an article on chemical

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warfare (it is not too late, because it can still come under Warfare) in which this important subject would receive full treatment and in which the activities of British chemists would obtain recognition. It is a curious fact that the need for such an article was emphasised by Sir Edward Thorpe himself in the review he wrote on the book published recently by Prof. Moureu in which this distinguished French chemist describes the activities of his own countrymen. In the next edition the article on chemical warfare might well follow that on chemical affinity.

One is glad to note that the old article on vegeto-alkaloids is to be abandoned, and the different subjects are to be treated under their own heads; thus there is an excellent article on cinchona alkaloids by B. F. H. and O. C., which gives a full account of these important substances. The articles on the natural colouring matters and allied substances by A. G. P. are especially noteworthy, as are those on certain drugs, which fall within this section, by G. B. It is articles such as these which render the dictionary indispensable to the research worker, because they give in a clear and concise manner all the essential details of the chemistry of the substances dealt with and do not confuse the issue by a mass of irrelevant data. It is usually difficult to find information of this kind elsewhere.

Of the longer articles on subjects of general interest, those on carbon, coke manufacture, and recovery of by-products by W. A. B. and E. R., copper cyanides by T. E., distillation by S. Y., and gaseous explosion by W. A. B. and R. V. W., have been brought up to date but otherwise retain the features which have rendered them so useful in previous editions.

There are some completely new articles, and, of these, that on colour and chemical constitution by E. R. W. is particularly interesting. Most chemists will be familiar with the book on this subject which the same author contributed to the series of monographs on industrial chemistry edited by Sir Edward Thorpe, and although they may not all agree with many of the views expressed therein, they cannot but acknowledge that the account given is a fair and clear description of our present position in regard to this very complex question. The present article may be described as a *précis* of the book, and is well worth perusal. Another new article is that by J. N. F. on the corrosion of metals. This is a subject which this chemist has made his own, and there are few who can write on it with greater authority. It is well written, and presents the subject from a point of view which cannot fail to be interesting. The article on dyeing remains much the same as in former editions. One wonders if the tables for detecting colours on the fibre, which occupy fifteen pages, are really worth the space. It may be noted in passing that although the excellent article on cholesterol is signed I. S. M., the name of this distinguished lady does not appear among those of the eminent contributors at the commencement of the volume.

J. F. T.

A New View of Fertility.

The Law of Births and Deaths: Being a Study of the Variation in the Degree of Animal Fertility under the Influence of the Environment. By C. E. Pell. Pp. 192. (London: T. Fisher Unwin, Ltd., 1921.) 12*s*. 6*d*. net.

IN the issue of NATURE for September 22, 1921, p. 105, appeared an article on "Causes of Fluctuation of the Birth-rate," the statements and speculations in which are usefully supplemented in the present volume, which is a valuable contribution to the discussion of this important problem. The main thesis of the book is that the decline of the birth-rate is not explicable on the hypothesis that it is due to the deliberate evasion of child-bearing, but that it can be explained as the result of a natural law the function of which is to adjust the degree of fertility to suit approximately the needs of the race. Much ingenuity is displayed in arriving at the conclusion that the response to the action of the environment in the degree of fertility bears an inverse proportion "to the intensity of the nervous charge," and that the principle involved is a law governing the union of sperm cell and ovum. Unlike Doubleday, whose theory was that a plethoric condition of the organism is unfavourable to fertility, Mr. Pell regards food as only one factor and thinks there is good reason for believing that cerebral development and mental activity are far more important than the supply of food. In this respect his theories approximate to the well-known views of Herbert Spencer as to the inverse relationship between ability to maintain individual life and the ability to multiply.

The arguments by which the above propositions are supported are ingenious and suggestive, although occasionally weak and doubtful points are presented with as great confidence as strong arguments. Thus the author argues from very imperfect data that the sale of contraceptive articles does not take place on a scale large enough to account for the lowered birth-rate, and he assumes the accuracy of the limited data available as to sterility and small families in circles where contraceptive methods are or are not practised. Such data would need to be corrected for age distribution of the married couples under comparison and for the duration of marriage before valid inferences could be drawn. Even then it would scarcely be practicable

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